Faculty of Engineering

PALLET DESIGN IMPROVEMENTAND HOW A POOR DESIGN WILL AFFECT THE WORKERS

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PALLET DESIGN IMPROVEMENT AND HOW A POOR DESIGN WILL AFFECT THE WORKERS

SITI FATIMAH BINTI JASNI

A dissertation submitted in partial fulfillment

of the requirement for the degree of

Bachelor of Engineering with Honours

(Mechanical and Manufacturing Engineering)

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Dedicated to my parents, Jasni bin Mohd Ali and Nora binti Yaacob, family and friends.

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Reach out my dream.

ABSTRACT

The purpose of this study is to improve the design of the pallet in terms of ergonomics and how poor design will affect the performance of the employee. To achieve mentioned objectives, Rapid Upper Limb Assessment (RULA) was used to evaluate the working posture. There are three designs including the original design pallet which the measurement is taken from Ekapaksi Sdn. Bhd Company. Based on the original design, improvements have been made up and the resulting is Pallet A. Pallet A is designed but in view of the weakness of certain terms so the pallet has been improved again become Pallet B. Each of pallets is going through analysis test using software elected. Thus, by comparing the results of the analysis of the pallets, Pallet B is classified as the best.

ABSTRAK

Tujuan kajian ini adalah untuk menambahbaik reka bentuk pallet dari segi ergonomik dan bagaimana reka bentuk yang lemah akan memberi kesan kepada prestasi pekerja. Untuk mencapai matlamat yang disebutkan Penilaian Atas Limbung Rapid (RULA) digunakan untuk menilai postur kerja. Terdapat tiga reka bentuk kesemuanya termasuk reka bentuk asal pallet yang diambil daripada syarikat Ekapaksi Sdn. Bhd. Berdasarkan reka bentuk yang asal, penambahbaikan telah dibuat dan terhasil lah Pallet A. Pallet A telah direka tetapi memandangkan terdapat kelemahan dari segi tertentu jadi pallet tersebut telah ditambahbaik lagi menjadi Pallet B. Setiap pallet-pallet tersebut akan melalui kajian analisis dengan menggunakan perisian yang terpilih. Jadi, dengan membandingkan keputusan analisis pallet-pallet itu, Pallet B diklassifikasikan sebagai yang terbaik.

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INTRODUCTION

1.0 Introduction

This research is about the pallet design improvement and how a poor design will affect the workers. The design improvement of pallet is needed to overcome the problem of workers' health, the safety aspect itself, space consumption and cost reduction. Besides that, the current pallet used is not fit for the workers and risky to handle. By understanding the problems in manufacturing industry, the pallet design can be improvised to minimize the bad effects and give optimum comfort to workers besides reducing space usage and improve management.

1.1 Background Study

The pallet is a medium used to store the component needed for production lines. In the dictionary, it mentioned that pallet is a small, low, portable platform on which goods are placed in storage or moving, as in a warehouse or vehicle. Basically, there are few conditions that need to be considered while designing pallet such as ergonomics, pallet types, pallet material, dimension, area, and others. These conditions must be followed to make sure that the pallet has good design criteria.

1.2 Scope of Study

The scopes of study for this project are as listed below:

i. Identify the facts about pallet used in manufacturing industry.

ii. Identify the factors to be considered during the design stage.

iii. Identify the risks during handling the pallet.

iv. Identify the effect on the workers due to a poor design.

1.3 Problem Statement

The purposes of this project are to improvise the pallet design and research on the effects of poor design to the workers. In order to improvise, the existing pallet had to be evaluated based on the concerned aspects and criteria. A review on the existing pallet is necessary to find out what are the factors that contribute to the ergonomics and safety of workers to handle the pallet.

The main concern while designing the pallet is to give optimum comfort and minimum impact to the workers. In the manufacturing industry, the workers perform repetitive movements that can cause stress on certain parts of the body. The results of the movement cause the workers having body aches, back pain and so on, which can interfere with the quality of the work of the workers. So, the best way to overcome this problem is to design a pallet that fit the workers not the workers fit the pallet.

The current pallet used has high tendencies to put a great risk to workers. This is because some of the existing pallet has the criteria that will danger the workers. Some of existing pallet has sharp edges that it may harm handler. Besides that, the compartment made up not suit the component stored. Next, the problem related to the pallet is heavy and difficult to move.

1.4 Objectives

As discussed from the problem statement, in order to overcome the problems faced in the manufacturing industry, research should be conducted in order to design a pallet with more ergonomics features and safe for production line. Thus, the objectives of this research are classified as:

i. To identify the effect that occurs to the workers because of poor design
ii. To investigate the health problem and safety during handling pallet in the shop
iii. To design an ergonomically-improved pallet that gives maximum comfort and minimum impact to the workers of manufacturing industry

1.5 Methodology

The stages of making this study are as below;

i. Stage 1: Introduction
ii. Stage 2: Literature review
iii. Stage 3: Methodology (Software simulation)
iv. Stage 4: Analysis of data
v. Stage 5: Discussion
vi. Stage 6: Conclusion/ Summary

1.6 Expected Outcome

In this research, we expect to know the factors of poor design that will affect the workers. The poor design of the pallet will cause health problem and injuries to the workers. Therefore, a study on the design improvement of pallet and how poor design will affect the worker is done. An improvement of the design is needed to minimize the problems and produce ergonomic pallets that give optimum comfort to the workers or employed. The main aim of this project is to enhance workers' performance while handling the pallet. By knowing this, we can analyze the design and do the improvement.

1.7 Summary

At the end of this chapter, a good design of the pallet should be ergonomics to help workers do their job without health problem and injuries. A pallet or machine that is being handled should, fit the workers and not the workers fit the pallet. The problem statement regarding this study is also being introduced in this chapter. In addition, the objectives, methodology for making this study and scope of the study are also clearly stated in order to direct the effort for the desired outcome.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Mark White, an emeritus professor at Virginia Tech, director of the William H. Sardo Jr. Pallet, Container Research Laboratory, Center for Packaging and Unit Load Design it mentioned that: "Pallets move the world." (Tom, 2012)

The processing of design pallet involved varieties of processes and for each process, it needs different step to get the best design of pallet. For each process it also needs to consider the factor that will give bad effect to the workers.

2.1 The Common Uses of Pallet

A pallet is a structure that is used for transport and shipping. Pallets used to facilitate the delivery of commercial goods and shipping containers that can be sent in a stable manner by providing support so that they can be lifted by a forklift, pallet jacks, jacking device and front loaders. Pallets also allow handling and storage more efficient.

Most of the basic palette is made of wood, but some are made of metal, paper, plastic or recycled materials. In the manufacturing industry, pallets are usually made of metal because of their harsh handling.

2.2 Different Types of Pallet Racks

According to manufacturing experts, selective racks are the most usually utilized pallet racking system that is used in warehouses. Pallets can be accessed from the structure's aisle. Beams are generally acted as the support system for the pallets. This system is not restricted to one kind of storage, but can be customized according to the requirement and can be implemented in narrow, standard, or deep reach aisles.

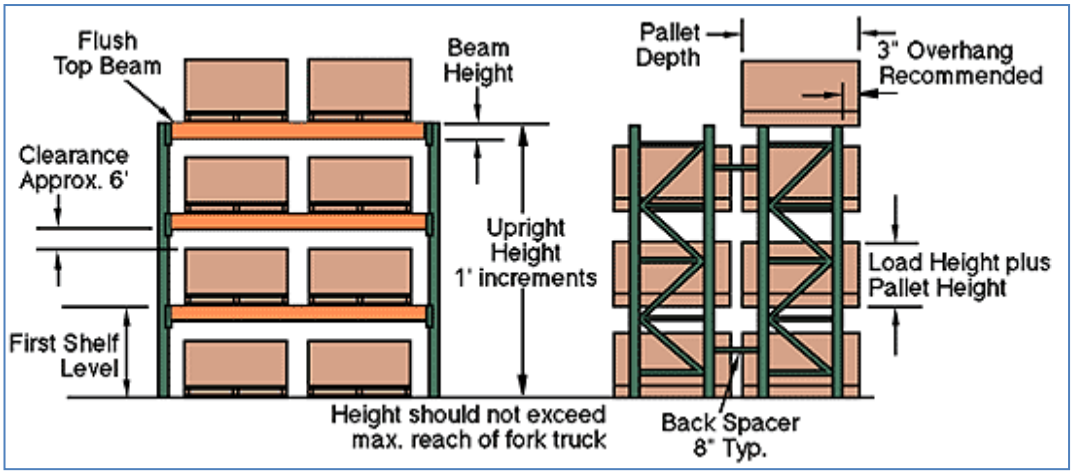

Figure 1 Selective Pallet Racks

(Source: Global Source)

Drive-in and Drive-Through Racks are structures that are designed with capabilities of high density storage. These systems are typically manufactured out of steel and have enough space between the bays or stack lanes to ensure the movement of

forklifts. While drive-in rack structures include one entry/exit way, drive-through racks have passage access on both sides of the bay. The way materials stored in these systems are influenced by differences entrance.

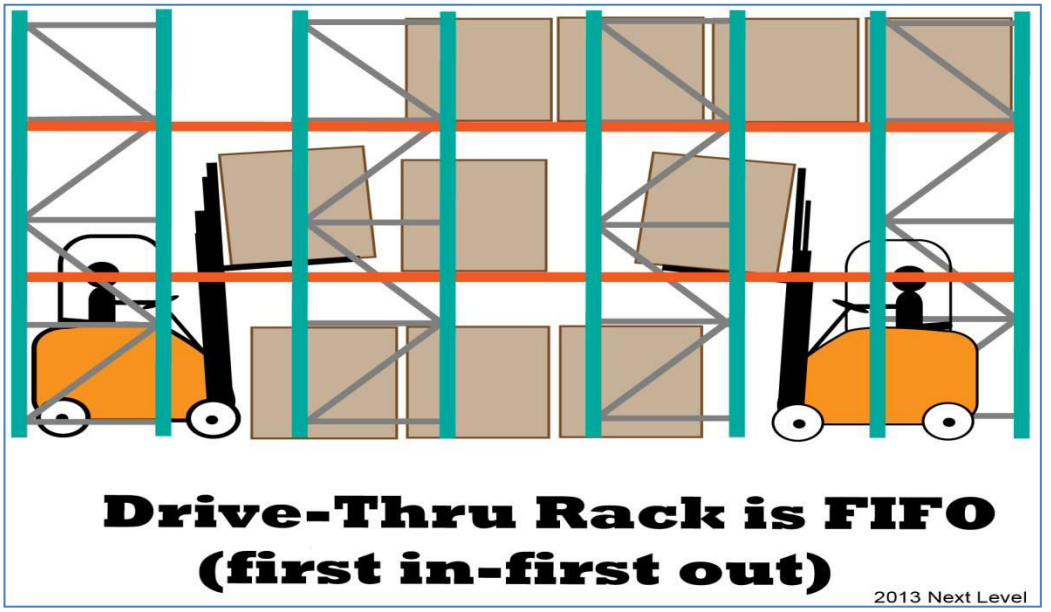

Figure 2 Drive-in and Drive-Through Racks

(Source: Global Source)

Amy Wu (2013) stated that push back racking systems is manufactured in structural or roll form. They are the perfect option for bulk storage, as they can store products that occupy several pallets in width, as well as height. When a pallet loads on the structure, it tends to push back the next pallet on the rails where its origin. Meanwhile, when the pallets are unloaded from the rails, they are pushed to the front of the structure. This system is considered suitable for large storage systems. These structures normally feature inclined rails and sliding carts, and are regularly developed with double lanes.